24. Lower Gastrointestinal Hemorrhage

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- Lower gastrointestinal bleeding (LGIB) is defined as measurable bleeding from a source distal to the ligament of Treitz.
- LGIB is a broad term used to encompass the spectrum of symptoms ranging from minimal bleeding noticed on bathroom tissues associated with hemorrhoids to massive bleeding encountered with diverticular hemorrhage.
- Etiologies range from the rare small-bowel tumors to the frequently identified diverticular sources.
- The bleeding may be intermittent, leading to a challenging diagnostic and management dilemma.

Epidemiology

- A population-based study examining the inpatient hospital records of 2,115 patients from 1990–1993 in a California health maintenance organization found the annual incidence rate of LGIB was 22.5 per 100,000 (0.02 % of hospitalizations).
- The three most common etiologies were diverticulosis (41.6 %), colorectal malignancy (9.1 %), and ischemic colitis (8.7 %).

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Etiology

Diverticular Disease

- Diverticular bleeding as a source of LGIB occurs in 20–60 % of cases.
- In 75 % of patients, the bleeding will cease spontaneously.
- Rebleeding rates after the first episode are 25 % and increase to 50 % after two episodes.
- Diverticular bleeding relates to the development of pseudo-diverticula in areas of weakness in the colonic wall where the vasa recta, the intramural branches of the marginal artery, course through the muscular layers to the mucosa and submucosa.
- At the site of the diverticulum, the vasa recta travel in the serosa with no significant tissue between the mucosa, the vasa recta, and the lumen of the bowel.
- Asymmetric and eccentric rupture of the vasa recta leads to intraluminal, and not peritoneal hemorrhage.
- Anecdotally, bleeding diverticula are attributed to mostly right-sided disease despite the greater propensity to have left-sided diverticula.

Anorectal

- Anorectal sources commonly include hemorrhoids, anal fissures, and rectal ulcers. They are the etiology of LGIB in 11–17 % of patients.
- Bleeding from hemorrhoids or fissures is uncommonly associated with hemodynamic instability or large volumes of blood loss.
- Rectal ulcers can cause severe hemorrhage associated with hemodynamic instability, with almost half of them being identified by stigmata of recent hemorrhage, although the etiology of the ulcers is multiple and not frequently defined in the literature in bleeding patients.
- Careful historical elucidation of radiation treatment, sexually transmitted diseases (STDs), anorectal trauma, nonsteroidal anti-inflammatory drug (NSAID) exposure, liver disease associated with rectal varices, and other uncommon etiologies must be included in evaluations.
- Hemorrhoidal bleeding is generally limited to bleeding with bowel movements, although patients may describe spraying or splattering of blood in the bowel (see Chap. 11).

Angiodysplasia

- Angiodysplasias are vascular ectasias that can occur in the small- and large-bowel mucosa and submucosa.
- Small-bowel angiodysplasia is a common source of obscure gastrointestinal bleeding with up to a third of patients having this diagnosis.
- Colonic angiodysplasia has a prevalence of 1 % in the general population with a tendency for right-sided lesions.

- Angiodysplasia had been thought to be associated with aortic valvular disease and renal failure, but these associations have not been found in more statistically rigorous studies.

Malignancy

- Colorectal cancers are a source of LGIB in 9.1–13.6 % of patients and are associated with ulcerated tumors.
- As a symptom, rectal bleeding is seen in 6.5–17 % of patients diagnosed with rectal cancer.

Ischemic Colitis

- Ischemic colitis as an etiology of LGIB occurs in 9–18 % of patients.
- Patient present with abdominal pain (87 %) and bloody bowel movements (84 %) without diffuse peritonitis.
- There are multiple etiologies of ischemic colitis that affect both young and old patients: shock, autoimmune diseases, coagulopathies, long-distance running (with associated dehydration), mesenteric venous thrombosis, acute arterial thrombosis, emboli, small-vessel disease, and cocaine use.
- Despite the multitude of etiologies, the typical patient with colonic ischemia is either an elderly patient or a patient with multiple comorbidities such as cardiovascular disease, hypertension, and renal failure.
- Hospitalized patients with increased risk for ischemic colitis are patients undergoing open and endovascular abdominal aortic aneurysm repair for nonruptured aneurysms. These patients have an incidence of ischemic colitis of 2–3 % in open procedures and 1.3–2.9 % in endovascular interventions.
- The location of ischemic colitis is variable: right-sided, 8–14 %, splenic flexure 23–28 %, and left-sided, 50–87 %.
- Knowledge of the arterial blood supply and areas of collateral circulation is necessary to understand the potential areas for insult and the high likelihood of anatomic variations. Colonic blood supply is dependent on interconnection of the perfusing vessels by the marginal artery of Drummond, which connects the superior and inferior mesenteric arteries through a series of arcades.
- At the splenic flexure, there is an area without vasa recta in 11 % of individuals, which makes the area more susceptible to ischemic insult.
- The arc of Riolan is an artery connecting the left branch of the middle colic artery to the inferior mesenteric artery. It is present in only 7 % of individuals but can allow acceptable perfusion in the absence of other collaterals. The highly variable arterial anatomy of the colon makes it susceptible to ischemia as a complication of surgical and angiographic procedures used to treat LGIB, which can compound the management considerations.
- Acute mesenteric ischemia (small-bowel ischemia) can be either occlusive or nonocclusive.

Other Colonic Etiologies

- Postpolypectomy bleeding after colonoscopy ranges from 0.08 to 0.87 % with mortality in a large Canadian study of over 97,000 colonoscopies estimated at 1/14,000.
- Bleeding from a colorectal anastomosis requiring endoscopic therapy or surgery is rare with a rate of 0.5–1.8 %.
- If bleeding persists after resuscitation, transfusion, and correction of any coagulopathy, endoscopy should be used to identify and stop the bleeding. Therapeutic interventions include cautery, endoclips, and epinephrine injection. If these measures fail, surgical management should be undertaken.
- Gastrointestinal bleeding is a common presenting symptom in ulcerative colitis and Crohn's disease. However, acute hemorrhage with hemodynamic compromise is atypical.
- Patients with human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) have additional etiologies for LGIB.
- The most common etiologies are cytomegalovirus (CMV) colitis, idiopathic colonic ulcers, lymphoma, and idiopathic colitis.
- Recurrent bleeding occurred in 17.6–22 % of patients with mortality rates as high as 54.5 %.
- Overall, the 30-day mortality rate was three times higher (14.4 % versus 5 %) for patients with HIV and LGIB than for the routine population.
- Documented adverse effects of NSAIDs on the lower gastrointestinal tract include increased gut permeability (44–70 %), gut inflammation (60–70 %), malabsorption (40–70 %), and blood loss and anemia (30 %). A systematic review of 47 studies examining the use of NSAIDs and lower gastrointestinal (LGI) events found an increase in LGI events with NSAID use. However, the studies included in the review were varied; some were not originally designed to address the proposed hypothesis of the systematic review, and the studies of LGIB and NSAID use were either case controlled or unable to demonstrate a relationship due to the small sample size. NSAID use is common, and physicians should be cognizant of the potential harmful effects of their use on the lower gastrointestinal tract.
- Rectal injury due to pelvic radiation usually presents as bleeding and occurs in 95 % of patients within 1 year from treatment:
  - In most patients, bleeding will resolve, but in the minority of patients who go on to develop chronic radiation proctitis (5 %), management is problematic and repetitive.
  - Thermal coagulation with argon or Nd:Yag laser has been used with positive results.
  - Topical formalin in 3, 4, and 10 % solutions has also been successful for cessation of bleeding. Three or 4 % formalin is instilled in 50-ml aliquots for a total of 500 ml. Due to the associated rectal discomfort, this method is usually employed with some type of

analgesia. After each application, the rectum is irrigated with normal saline. Another option ("Dab" method) is to use 16-Fr cotton-tipped applicator that is soaked in 10 % formalin. This is applied to the rectal mucosa through an anoscope or a proctoscope. The Dab method can be performed in the office without analgesia.

– Success rates in both procedures range between 75 and 90 %.

- Surgical management is used as a last resort with high morbidity (65–80 %) and mortality rates (6.7–13 %). Surgical options include diverting stoma and limited resections.

Obscure Gastrointestinal Bleeding

- Obscure gastrointestinal bleeding (OGIB) is the bleeding not identified during colonoscopy or esophagogastroduodenoscopy (EGD).
- OGIB accounts for 1.19–9 % of LGIB with lower rates noted in larger studies.
- Angiodysplasia, small-bowel tumors, and ulcers/erosions are the three most common etiologies of OGIB.
- When diagnosing the source, patients with OGIB undergo more procedures than patients with upper gastrointestinal and colonic bleeding, 5.3 versus 1.5 and 2.1, respectively (Table 24.1).
- The diagnosis of OGIB was limited to upper and lower endoscopy and conventional radiography until 2001, when capsule endoscopy and double balloon enteroscopy (DBE) were introduced.
- Prior to these two technical advances, intraoperative enteroscopy was used to identify bleeding in the small bowel.
- Indications for capsule endoscopy include OGIB, unexplained iron-deficiency anemia, and suspected Crohn's disease, small-bowel tumors, or refractory malabsorptive syndromes. Contraindications are related to the structure and transmission signal of the capsule as well as the need for normal peristalsis for capsule efficacy.

Table 24.1 Diagnosis by etiology for patients admitted to an urban emergency medical center, 1998–2006

Etiology	N (%)
Diverticulosis	227 (37.34)
Hemorrhoids	128 (21.05)
Neoplasia	72 (11.84)
Colitis	65 (10.69)
Inflammatory bowel disease	33 (5.43)
Vascular ectasias	14 (2.30)
Other colonic disease	40 (6.58)
Small-intestine disease	8 (1.32)
Unknown	21 (3.45)
Total	608 (100)

- Therefore, patients with swallowing disorders, pacemakers or implanted devices, obstruction, fistula, or stricture are not candidates for capsule endoscopy. Entrapment of the capsule occurs in 3.3 % of procedures and is associated with Crohn's disease, radiation, and NSAID-induced strictures. Indications for DBE include a positive capsule endoscopy and a high suspicion of a small-bowel source in the setting of a normal capsule study.
- DBE has the ability to perform therapies such as sclerotherapy, polypectomy, dilations, and clippings. DBE can be performed from anterograde (oral) or retrograde (rectal) approach. Patients undergoing the anterograde approach require a 6–8-h fast prior to the procedure, while those having a retrograde exam need a bowel preparation.
- The diagnostic yield of capsule endoscopy and DBE is 38–83 % and 58 %, respectively. Two meta-analyses comparing capsule endoscopy and DBE found similar diagnostic yields.

Clinical Presentation, Physical Exam, and Management

- LGIB has many presentations reflecting the diverse pathology found in the upper and lower gastrointestinal tract.
- Evaluation of a patient's hemodynamic stability upon presentation is imperative.
  - Tachycardia and hypotension represent acute hemorrhagic shock associated with a blood loss of more than 500 ml or 15 % of the total blood volume. These patients require two large-bore IVs or central venous access for resuscitation if peripheral access cannot be obtained. Continuous monitoring of vitals and urine output with a urinary bladder catheter is standard. Nasogastric tube (NG) placement has been recommended routinely to rule out an upper gastrointestinal source of bleeding. NG placement is a fast and inexpensive diagnostic test that, if positive (clots, coffee-ground emesis, blood), can quickly direct the workup toward identification of an upper gastrointestinal source. Upper gastrointestinal sources are seen in 11 % of patients who present with an LGIB. The NG tube can be left in and used for the bowel preparation if an urgent colonoscopy is needed.
    - After intravenous access has been obtained, resuscitation should start immediately. However, there are no systematic reviews, and only one randomized controlled trial evaluating the role of transfusions in gastrointestinal bleeding is available.
    - A Cochrane systematic review evaluating the resuscitation of trauma, burn, and surgical patients with either crystalloid or colloids found no survival benefit using colloids instead of crystalloids.
    - Despite the lack of large, randomized trials evaluating transfusion requirements in patients with LGIB, there is mounting evidence that limiting or eliminating transfusions leads to

improved outcomes such as decreased mortality and morbidity.

- The patient's history should be taken simultaneously with the placement of intravenous access and monitors if the patient is hemodynamically unstable. Important aspects of the history that should be elucidated are given as follows: frequency, volume, color, and duration of bloody stools; comorbid conditions such as liver and cardiovascular disease; medication use such as clopidogrel, warfarin, and NSAIDs; and date of last colonoscopy/EGD.
- Visual inspection of the perineum for prolapsed or thrombosed hemorrhoids, anal fissures, or masses are the first part of the anorectal exam.
- After visual inspection, digital rectal exam and anoscopy are performed. It is imperative to assess the anus, anal canal, and distal rectum prior to further diagnostic tests. Anoscopy can be performed efficiently at the bedside, and if a source is found, such as internal hemorrhoids, therapy can be provided.
- Laboratory studies should include a chemistry panel, complete blood count, coagulation profile, and a type and cross. Any identified coagulopathies must be corrected with appropriate factors or products. Patients with cardiovascular disease should undergo an electrocardiogram, and if it turns out to be abnormal, cardiac enzymes are obtained.
- After the initial clinical evaluation and review of laboratory values, the volume of hemorrhage can be classified into one of the following three groups: (1) minor and self-limited, (2) major and self-limited, and (3) major and ongoing.
- Patients with minor and self-limited lower gastrointestinal bleeding with no or minimal change in hematocrit are unlikely to be hemodynamically unstable. These patients can undergo a colonoscopy during their admission or as an outpatient.
- Patients with massive, ongoing bleeding who remain hemodynamically unstable after initial resuscitation need urgent diagnosis and treatment either with angiography or with surgery.
- Patients in the middle of the spectrum with major bleeding who are stable or their bleeding has ceased are the patients at the core of the diagnostic dilemma surrounding LGIB.
- The most common diagnostic tests that can be employed for identifying the etiology of an LGIB are colonoscopy, angiography, CT angiography, and nuclear scintigraphy.

Colonoscopy

- Colonoscopy can be both diagnostic and therapeutic.
- The likelihood of identifying the source of bleeding with colonoscopy ranges from 45 to 95 % with the majority of studies with greater than 100 patients showing diagnostic yield rates of 89–97 %.
- The timing of colonoscopy is debatable. Urgent colonoscopy has been performed within 24 h, within 12 h, and after a fast oral purge, making comparison between studies challenging.
- In some studies, early colonoscopy has been associated with decreased length of stay.
- All studies evaluating urgent colonoscopy except one had patients undergo a bowel preparation, which would improve visualization and decrease the difficulty of the procedure and any endoscopic therapy. Endoscopic interventions were performed in 10–15 % of patients who underwent an urgent colonoscopy. Interventions include heater probes, argon plasma coagulation, bipolar coagulation, topical and intramucosal epinephrine, and endoclips (Fig. 24.1).
- Overall complication rate of colonoscopy in LGIB is 1.3 %.
- Patients with major, self-limited hemorrhage who have been resuscitated should undergo a bowel preparation with a polyethylene glycol solution and colonoscopy within 24 h.
- The goal of colonoscopy is to identify a source of bleeding and, if possible, treat it endoscopically. If a bleeding source is noted, the area should be marked, and the patients who rebleed require emergent surgery. Anatomic localization during endoscopy has known limitations and errors, and without a definitive mark (clip or tattoo) resection can be prone to error.

Angiography

- Angiography can be both diagnostic and therapeutic (Fig. 24.2).
- Angiography has both broad positivity (27–77 %) and sensitivity (40–86 %), with specificity being 100 %.
- For angiography to be positive, bleeding must occur at 0.5 ml/min or faster. Small, single-institution retrospective studies have shown blood pressure less than 90, transfusion requirement greater than 5 units, and a blush within 2 min on nuclear scintigraphy to be associated with positive angiograms.
- Superselective embolization is the preferred treatment for positive angiograms. Recent studies have demonstrated success rates from 60 to 90 %, rebleeding rates of 0–33 %, and significant ischemia of less than 7 %.
- In addition, a meta-analysis found embolization of diverticular disease was three to four times more effective than embolization of nondiverticular sources.
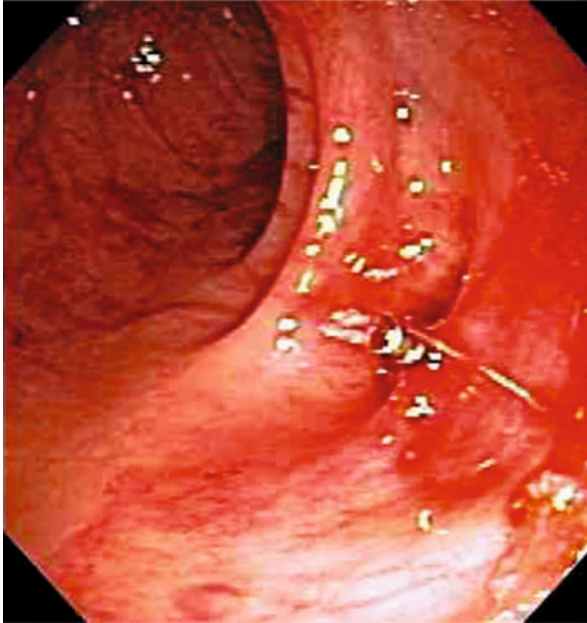- Superselective embolization occurs at the level of the vasa recta or marginal artery.

Fig. 24.1 Clip applied to bleeding diverticular vessel

- Materials used for embolization include microcoils, polyvinyl alcohol particles, and gelfoam. They may be used individually or in combination. Microcoils are permanent materials with multiple sizes that are easily visible during fluoroscopy.
- Polyvinyl alcohol particles are also permanent and will be carried by the circulation to the bleeding site which has the least resistance to flow. These particles have decreased selectivity and are poorly visualized. Gelfoam is not a permanent agent with vessel recannulization in days to weeks but it is not routinely used. Material choice is decided by location, angiographer expertise, and microcatheter position in relation to the bleeding vessel. Technical aspects that can lead to failure or inability to embolize are atherosclerosis, vascular tortuosity, and vasospasm.
- Patients with major, ongoing hemorrhage or patients who rebleed need angiography.
- Similar to colonoscopy, the goal of angiography is to localize the source of bleeding and provide directed therapy.
- If superselective embolization is unable to be performed, but a bleeding site is localized, angiographers can inject methylene blue into the artery providing a temporary marker for the surgeon.
- Another option is highly selective, intra-arterial vasopressin infusion. The potent arterial contraction may reduce or halt the hemorrhage. Infusion rates of vasopressin being at concentrations of 0.2 U/min may
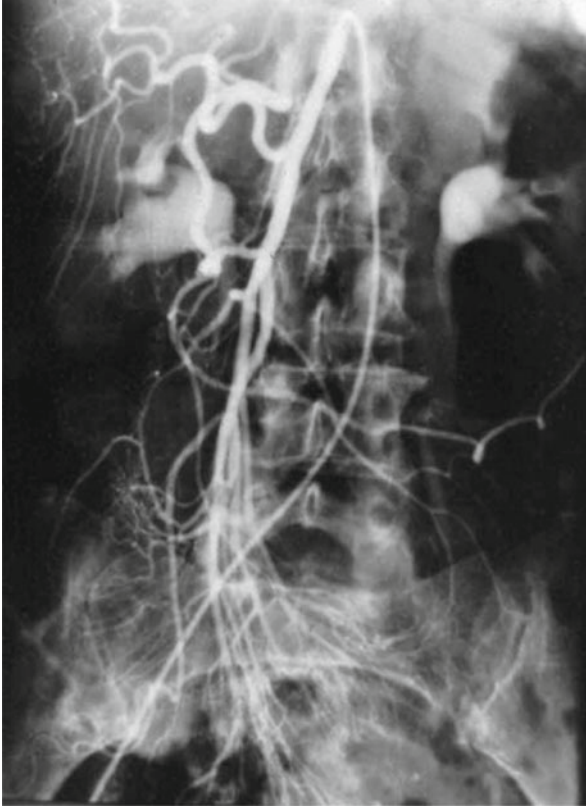
Fig. 24.2 Angiogram demonstrating extravasation (hemorrhage) in cecum

progress to 0.4 U/min. The systemic effects and cardiac impact of vaso-
pressin may limit maximizing the dosage. Vasopressin controls bleeding
in as many as 91 % of patients. However, bleeding may recur in as many
as 50 % of patients once the vasopressin is tapered.

- In patients who have negative upper and lower endoscopy with continued
evidence of bleeding, angiography can be used to localize the source.
However, superselective embolization for sources other than diverticula
has higher failure rates.

- Since most LGIB is sporadic, it is not uncommon to be unable to localize
the source, even after an EDG, a colonoscopy, and an angiography.
Provocative angiography, which uses anticoagulants, vasodilators, or
fibrinolytics to induce bleeding, can be used in these cases. Agents used in
these procedures include urokinase, streptokinase, and tissue plasmino-
gen activator. Studies evaluating provocative angiography are small and
from single institutions with identification of the bleeding source varying
from 20 to 80 %. If a bleeding site is identified, superselective emboliza-
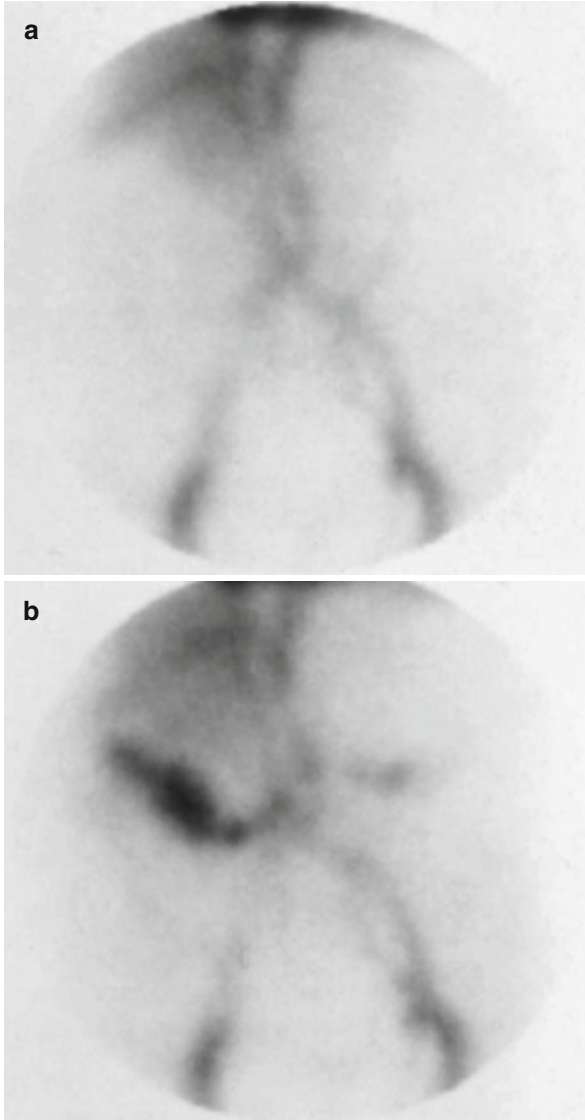tion can be used for treatment.

Fig. 24.3 Selected images from a 99mTc-labeled RBC gastrointestinal bleeding study in a patient with known diverticulosis. Images acquired at 1 min (**a**) and 14 min (**b**)

Radionuclide Scintigraphy

- Nuclear scintigraphy or the radioactive labeling of red blood cells is used to evaluate patients with LGIB (Fig. 24.3a, b).
- In comparison to colonoscopy or angiography, it does not have any therapeutic capabilities. However, it is not invasive, does not require a bowel preparation, or requires specialists to be called in to perform the study.

- Bleeding at rates as low as 0.1 ml/min can be detected. Red blood cells are labeled with technetium or sulfur colloid.
- Technetium-labeled red blood cell (TRBC) scanning is positive in 16–91 % of patients.
- A number of studies have attempted to define characteristics of positive TRBC scans. Scans that are positive early have shown increased positivity on angiography and accuracy rates in some studies, but not in others.
- The largest study examining the predictive value of scintigraphy retrospectively reviewed 249 scans and 271 arteriograms. Using a positive scintigraphy as a requirement for angiography led to an increase in positive angiograms from 22 to 53 %. Common clinical parameters such as hemodynamic instability and the number of blood transfusions are not associated with a positive TRBC scan. A more reliable indicator than the overall number of blood transfusions may be the number of units transfused within the 24 h preceding scintigraphy. Multivariate analysis confirmed that patients who received more than 2 units of packed red blood cells within 24 h prior to the scan were twice as likely to have a positive study.

Abnormal increased isotopic activity developed in the proximal transverse colon, which progressed antegrade to the descending colon.

- The role of radionuclide scintigraphy in the management of LGIB continues to be poorly defined.
- In patients who have major, self-limited hemorrhage and are stable to go to radiology, this test, if positive early, can direct further workup and management.
- However, if radionuclide scintigraphy is negative, rebleeding rates are not negligible.
- One advantage of TRBC is that rebleeding within 24 h can be restudied promptly without a second labeling procedure.
- Surgical resection based on radionuclide scintigraphy is not recommended.

Multidetector Row CT

- Multidetector row computed tomography (MDCT) or CT angiography (CTA) may have an increasing role in the diagnostic workup of LGIB.
- MDCT is considered positive when vascular contrast material is extravasated into the bowel lumen.
- MDCT offers the following advantages over radionuclide scintigraphy: (1) it is easy to perform and readily available in emergency rooms with CT scanners, (2) accurate localization of the bleeding site, which allows for a directed angiogram and less contrast use, and (3) identification of other pathologies.

Surgery

- Emergent surgery is necessary in hemodynamically unstable patients who have massive ongoing bleeding and are unresponsive to the initial resuscitation, patients who have had the source of bleeding localized but no therapeutic measures were performed or they failed, and patients who have required at least 6 units of packed red cells within 24 h.
- The need for emergent, exploratory surgery without a localized source of bleeding is uncommon. Prior to surgery, ileostomy, and colostomy, sites should be marked when possible.
- An open laparotomy through a midline incision that allows access to both the upper and lower gastrointestinal tract should be performed. Examination of the entire intra-abdominal gastrointestinal tract is required with focus on identifying blood within the bowel lumen. The stomach, duodenum, small bowel, and colon are visually examined and palpated.
- If there is no identifiable bleeding source and localization was not successful, push intraoperative enteroscopy (IOE) can be considered. Transillumination of the bowel may identify a source such as angiodysplasia or small tumors. IOE is technically challenging and time-consuming. The identification of bleeding pathology occurs in 70–87 % of patients. However, rebleeding rates are 19–30 %. If a source of bleeding is identified, then resection is warranted.
- If no bleeding site is identified in the upper gastrointestinal tract or small bowel and the source is presumed to be colonic, then a total abdominal colectomy should be performed.
- If the patient was on vasoactive medication or is hemodynamically unstable, then an end ileostomy should be created. Postoperatively, these patients will require further resuscitation and possibly continued or intermittent pressor use, which can jeopardize a bowel anastomosis. In addition, the majority of patients with LGIB are elderly with multiple comorbidities augmenting the complexity of their management.
- The aim of the preoperative diagnostic workup is to localize the source of bleeding. If a colonic source is localized, then a segmental rather than subtotal colectomy can be performed. Nonlocalized segmental colectomy based on a clinical "best guess" is not a safe or reliable option.
- Mortality can be as high as 50 % and rebleeding rates as high as 75 %. Mortality rates associated with segmental and subtotal colectomy for LGIB are 4–14 % and 0–40 %, respectively.

Outcomes in Lower Gastrointestinal Bleeding

- The heterogeneity of patients with LGIB and the lack of randomized data concerning the diagnostic workup have led to studies attempting to characterize prognostic indicators (Table 24.2).

Table 24.2 Mortality of lower gastrointestinal bleeding by etiology

Investigator [ref]	Diverticulosis (%)	Angiodysplasia (%)	Cancer/polyp (%)	Colitis/ulcer (%)	Anorectal (%)	Other (%)	Mortality (%)
Jensen and Machicado (1997)	23	40	15	12	5	4	NA
Longstreth (1997)	41	3	9	16	5	14	3.6
Bramley et al. (1996)	24	7	10	21	9	4	5.1
Richter et al. (1995)	48	12	11	6	3	6	2
Rossini et al. (1989)	15	4	30	22	0	11	NA
Jensen and Machicado (1988)	20	37	14	11	5	5	NA

- The following clinical data are independent predictors of severity in LGIB: initial heart rate greater than or equal to 100, initial systolic blood pressure less than or equal to 115 mmHg, initial hematocrit less than or equal to 35 %, gross blood on rectal exam or rectal bleeding within the first 4 h of evaluation, aspirin use, and more than two active comorbid conditions.
- Severe LGIB was defined by one or more of the following clinical characteristics: transfusion of greater than or equal to 2 units of blood, decrease of hematocrit by greater than or equal to 20 % in the first 24 h, and recurrent rectal bleeding after 24 h of stability coinciding with a further decrease in hematocrit of greater than or equal to 20 %, more transfusions, and readmission within 1 week of discharge.
- Patients were considered high risk if they had greater than three risk factors and low risk if they had no risk factors. High-risk patients had increased rates of surgery and death, increased number of transfusions, and longer hospital stays.
- Prognostic factors for urgent surgery are hypotension on arrival (systolic blood pressure 70–80 mmHg) and the etiology of the bleeding. Urgent surgery and associated comorbidities (neuropathies, diabetes, hepatic, cardiovascular and pulmonary disease) were risk factors for morbidity and mortality. Postoperatively, only transfusion needs greater than 10 units predicted mortality and morbidity after multivariate analysis. The average number of units transfused prior to surgery in this study was 9.3. These findings support an earlier study from 1991 where patients who received less than 10 units had a 7 % mortality rate and patients who received greater than 10 units had a mortality rate of 27 %.
- The literature has shown that there are multiple options in the workup of LGIB that can be used interchangeably with adequate results. Urgent endoscopy can be performed as the first diagnostic step, followed by other localizing studies if not successful, but evaluation with TRBC followed by selective angiography if TRBC is positive can also be successful for localization. Studies have shown clearly that segmental colon resection after radionuclide scintigraphy alone is ill advised and that blind resections have high rebleeding rates and lead to worse patient outcomes. The steps in the workup remain variable but should be tailored to a physician's expertise and hospital resources.
- Billingham's description, in 1997, of LGIB as a conundrum with five main problems continues to reflect the current management issues.
  - First, bleeding can be from any location in the gastrointestinal tract.
  - The second problem faced by surgeons is the sporadic nature of lower gastrointestinal bleeding.
  - The third problem is the necessity of surgical intervention prior to localization.

- – Fourth, rebleeding after extensive resections remains a concern.
  - – Finally, there are few consensus statements regarding diagnosis and management.
- Certainly, the conundrum has not been solved. However, a variety of new technologies and evolving methods of treatment are allowing clinicians to make progress with less dramatic interventions for patients.
- New imaging techniques such as MDCT may be able to efficiently identify sources of bleeding and guide management with less delay and better anatomic definition.
- Superselective angiography can provide safe and accurate diagnostic and therapeutic options.
- Capsule endoscopy can assist in locating obscure bleeding sources and has become the standard of care for workup in a nonacute setting.
- DBE will become more available and may provide multiple therapeutic options for lesions not reached by traditional endoscopic techniques, but is not advocated in the urgent or emergent setting at this time.
- Acceptance and practice of urgent colonoscopy and superselective angiography provide opportunities to identify the source prior to surgery and even avoid surgery entirely.
- In addition, the diagnostic and therapeutic options available with colonoscopy, capsule endoscopy, DBE, and superselective angiography offer a variety of options to localize and treat the source with minimal risk compared to emergent surgery.
- Nevertheless, LGIB can be a challenging event for the patient and physician.
- Successful treatment of LGIB requires the ability to perform massive resuscitation, expeditious workup, and skilled surgical assessment with prompt operative intervention when required.
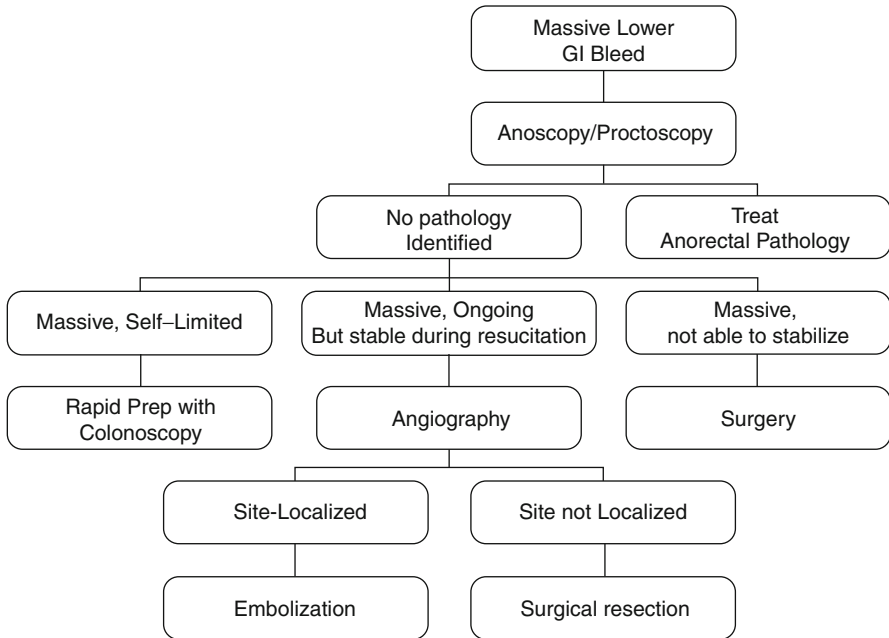- An algorithm summarizing the management is provided in Fig. 24.4.

Fig. 24.4 An algorithm summarizing the management

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